

PATENT ABSTRACTS OF JAPAN

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H04R 25/00(21)Application number : **10-001079**(71)Applicant : **MATSUSHITA ELECTRIC IND CO LTD**(22)Date of filing : **06.01.1998**(72)Inventor : **TSUDA KENJIRO
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MIKI TAKAYASU****(54) DEVICE FOR TRANSMITTING INFORMATION WITH VIBRATIONS****(57)Abstract:**

PROBLEM TO BE SOLVED: To provide a device for transmitting information with vibrations with which information can be transmitted while having peculiar meaning more than presence/absence by providing a vibration generating means capable of controlling either frequency or amplitude at least and vibrating the vibration generating means while using secondary analytic data.

SOLUTION: Primary audio analytic data (such as a term T of sound existence, maximum amplitude A and maximum frequency F) generated by a computer M are sent to a vibration output device 12. The vibration output device 12 multiplies a prescribed coefficient Ca concerning the maximum amplitude A, multiplies another prescribed coefficient Cf concerning the maximum frequency F and generates secondary audio analytic data (Ca.A1.Cf.F1.T1) from the primary analytic data (A1, F1 and T1). Then, this frequency information is converted to analog information by a D/A converter and impressed to a pulse generator. Amplitude information is converted to analog information and applied to an amplifier later. When the required information is sent, the pulse generator outputs a pulse at the frequency of Cf.F1. for the term T1. The amplifier amplifies the pulse to the amplitude of Ca.A1. Then, the vibration generator performs vibration with these frequency and amplitude.

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CLAIMS**[Claim(s)]**

[Claim 1]Decompose for every syllable and speech information inputted as a means to input speech information. A means to extract primary analytical data about a sound in each syllable, and to memorize

it, A data transmission unit by vibration characterized by having a means to change into secondary analytical data which had primary analytical data read from a memory measure corrected, and a vibration generating means of frequency and amplitude which can adjust either at least, and making a vibration generating means vibrate using these secondary analytical data.

[Claim 2]A data transmission unit by the vibration according to claim 1, wherein the above-mentioned primary analytical data are the amplitude of a sound.

[Claim 3]A data transmission unit by the vibration according to claim 1, wherein the above-mentioned primary analytical data are the frequency of a sound.

[Claim 4]A data transmission unit by the vibration according to claim 1 while the above-mentioned primary analytical data are the amplitude of a sound, wherein the above-mentioned secondary analytical data apply amplitude of a sound by a predetermined coefficient.

[Claim 5]A data transmission unit by the vibration according to claim 1 while the above-mentioned primary analytical data are the frequency of a sound, wherein the above-mentioned secondary analytical data apply frequency of a sound by a predetermined coefficient.

[Claim 6]A data transmission unit by the vibration according to claim 1, wherein the above-mentioned primary analytical data are the time length of a syllable.

[Claim 7]A data transmission unit by the vibration according to claim 1, wherein the above-mentioned primary analytical data are the time length between syllables.

[Claim 8]A data transmission unit by the vibration according to claim 1 inputting a means to input speech information, with human being's sound.

[Claim 9]A data transmission unit by the vibration according to claim 1 inputting in a text a means to input speech information.

[Claim 10]A data transmission unit characterized by comprising the following by the vibration according to claim 1.

A transmitting means which transmits primary analytical data.

A reception means which receives transmitted primary analytical data.

[Claim 11]A data transmission unit by the vibration according to claim 1 characterizing by having a means to output a start signal which reads memorized primary analytical data.

[Claim 12]A data transmission unit by the vibration according to claim 11, wherein a means to output the above-mentioned start signal is a timer.

[Claim 13]A data transmission unit by the vibration according to claim 11, wherein a means to output the above-mentioned start signal is a heartbeat measurement means.

[Claim 14]A data transmission unit by the vibration according to claim 11, wherein a means to output the above-mentioned start signal is a pulse measurement means.

[Claim 15]A data transmission unit by the vibration according to claim 11, wherein a means to output the above-mentioned start signal is a sweat sensor means.

[Claim 16]A data transmission unit by the vibration according to claim 1, wherein the above-mentioned vibration generating means comprises a piezoelectric element.

[Claim 17]A data transmission unit by the vibration according to claim 1, wherein the above-mentioned vibration generating means comprises a vibration body with a motor and an eccentric cam.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention analyzes the feature of an audio signal, changes it into vibration data, and relates to the data transmission unit by vibration which gives information with a vibration pattern.

[0002]

[Description of the Prior Art]The method performed as a means to transmit information, using an acoustic sense, vision, or a tactile sense is known. Methods of using an acoustic sense include the ringer tone of a telephone, the conversation in a telephone, the ringer tone of a pager, etc. Methods of using vision include the message indicator of a pager, etc. Methods of using a tactile sense include vibration used instead of a cellular phone and the ringer tone of a pager.

[0003]When using vibration, vibration of the single rhythm is used. That is, when using a cellular phone and a pager in the inside of a meeting, and a movie theater, since a ringer tone becomes troublesome [others], it vibrates in a rhythm with a single vibration body instead of a ringer tone. The user can know that there was mail arrival, without being noticed by others if there is vibration.

[0004]In the former, the oscillating **** signal transduction using a tactile sense is chiefly used only for the check of existence, and was not giving the information more than existence to the vibration itself.

[0005]

[Problem(s) to be Solved by the Invention]As mentioned above, only the information on the fixed limit called existence was transmitted to the signal transduction by vibration using a tactile sense. Then, an object of this invention is to provide the data transmission unit by vibration which can give the peculiar meaning more than existence and can transmit information, even if it is the signal transduction by vibration using a tactile sense.

[0006]

[Means for Solving the Problem]This invention by the 1st viewpoint decomposes for every syllable, and speech information inputted as a means to input speech information. A means to extract primary analytical data about a sound in each syllable, and to memorize it, A means to change into secondary analytical data which had primary analytical data read from a memory measure corrected, It is a data transmission unit by vibration characterized by having a vibration generating means of frequency and amplitude which can adjust either at least, and making a vibration generating means vibrate using these secondary analytical data.

[0007]Thereby, a person holding a vibration generating means senses strength of vibration, or frequency of vibration from experience, and it becomes possible to receive not only existence of vibration but a peculiar meaning.

[0008]

[Embodiment of the Invention]Drawing 1 shows a 1st embodiment of the data transmission unit by vibration concerning this invention. As for a memory and 8, in drawing 1, a sound / text input device, and 4 are [a display and 12] vibration output devices a storage unit and 10 CPU (central arithmetic unit) and 6 2.

[0009]A sound / text input device 2 inputs "do your best", "don't get impatient", "fall and attach", etc. with human being's sound, for example. The voice pattern of "do your best" is shown in drawing 9, and it is. Instead of a sound, it is also possible to input "do your best" as text data with a keyboard or a touch pen.

[0010]CPU4, the memory 6, and the storage unit 8 constitute the microcomputer M. CPU4 carries out

the A/D conversion of the inputted audio signal, and it divides a sound for every syllable, and it memorizes the duration T of a sound and the peak magnitude A of a sound in each syllable, and the maximum frequency F. The operation in CPU is shown in drawing 11.

[0011]In drawing 11, a sound is inputted first (Step S1) and an audio A/D conversion is made (Step 2). It is judged whether the amplitude of the inputted sound is zero (Step S3), and if it is not zero, it will ***** the counter A (step S4). Then, amplitude data is detected (Step S5), and after the counter A begins a count, the old peak magnitude data A is memorized (Step S6). Frequency conversion is made by inclination of the waveform of the inputted sound (Step S7), and a frequency component is detected (Step S8). And after the counter A begins a count, the old maximum frequency data F is memorized (step S9).

[0012]In Step S3, if the amplitude of the inputted sound is zero, it will ***** the counter B (Step S10). Then, when it is judged whether the counted value of the counter B exceeded the predetermined threshold (Step 11) and it has exceeded, it is judged that the soundless part of predetermined length continued and it is judged that there was a pause of a syllable. When not having exceeded, it returns to Step S2. When it is judged that there was a pause of a syllable, the value of the counter B is subtracted from the value of the counter A (Step S12), and the difference is memorized as the duration T of a sound (Step S13). And the counters A and B are reset (Step S14). If it is judged that there was a pause of a syllable, the pause information on a sound will be inserted (Step S15). And ***** [voice data] finally is judged, and if it is not an end, it will return to Step S1.

[0013]Although the difference of the counted value of the counter A and the counter B is taken in Steps 12 and 13 and he was trying to memorize the difference, it may be made to memorize each counted value of the counter A and the counter B as it is.

[0014]As an example of operation of this flow chart, the inputted voice data presupposes that it is that in "do your best." In this case, four syllables, "***", "***", "***", and "***", are detected, and about "***." They are memorized by the peak magnitude data A1, maximum frequency data F1, and the duration T1, and about "***." The peak magnitude data A2, the maximum frequency data F2, and the duration T2 are memorized, peak magnitude data A3, the maximum frequency data F3, and duration T3 are memorized about "***", and peak magnitude data A4, the maximum frequency data F4, and the duration T4 are memorized about "***." Record is performed in the recording unit 8.

[0015]The primary analytical data (the duration T, the peak magnitude A, the maximum frequency (F) of a sound) of the sound generated by computer M as mentioned above are sent to the vibration output device 12. The vibration output device 12 hangs predetermined coefficient-C about the peak magnitude A, about the maximum frequency F, hangs another predetermined coefficient-C f, and generates audio secondary analytical data. Coefficient-C a and Cf are decided according to the structure and the size of a vibration output device which are mentioned later. The conversion to audio secondary analytical data from primary analytical data may use a predetermined transformation or translation table instead of using a coefficient.

[0016]The primary analytical data of the sound which will have been sent to the vibration output device 12 if the above-mentioned example is explained (A1, F1, T1), (A2, F2, T2), (A3, F3, T3), and (A4, F4, T4). It is corrected within the vibration output device 12, and audio secondary analytical data (Ca-A1, Cf and F1, T1), (Ca-A2, Cf-F2, T2), (Ca and A3, Cf-F3, T3), and (Ca and A4, Cf-F4, T4) are generated. A driving signal as shown in drawing 10 based on audio secondary analytical data is generated. That is, about the syllable of "***", into the time slot defined beforehand, amplitude is Ca-A1 and frequency carries out T1 period output of the signal which are Cf and F1. About the syllable of "***", into the following time slot, amplitude is Ca-A2 and frequency carries out T2 period output of the signal which is Cf-F2. About the syllable of "***", in the following time slot, amplitude is Ca and A3 and frequency outputs the signal which is Cf-F3 during T tertiary stage. About the syllable of "***", into the following time slot, amplitude is Ca and A4 and frequency carries out T4 period output of the signal which is Cf-F4. A syllable is inserted into the time slot beforehand decided to have mentioned above, and let the remaining time of each time slot be a time interval between syllables.

[0017]It may be made to perform conversion to audio secondary analytical data from primary analytical

data within the microcomputer M.

[0018]As long as it makes it include the counted value of the above-mentioned counter B in audio analytical data, it may be made to determine the time interval between syllables based on the counted value from the counter B.

[0019]The vibration output device 12 has a drive further. An example of a drive is shown in drawing 4.

[0020]As for a pulse generator and 36, in drawing 4, 30 and 32 are [the tremor and 40] power supplies an amplifier and 38 a D/A converter and 34. Frequency information is changed into an analog with D/A converter 30, and is added to the pulse generator 34. Amplitude information is changed into an analog with D/A converter 32, and is added to the amplifier 36. When the information about "***" has been sent in the case of an above-mentioned example, the pulse generator 34 carries out T1 period output of the pulse whose frequency is Cf and F1. The amplifier 36 amplifies the sent pulse to the amplitude of $C_a \cdot A_1$. And frequency is Cf and F1, amplitude is in the tremor 38 with the pulse of $C_a \cdot A_1$, and it performs T1 period vibration. An example of the tremor 38 is shown in drawing 5. The frequency information and amplitude information about "***", "***", "***", and "***" are read from the storage unit 8 by a predetermined start signal.

[0021]Drawing 5 shows the tremor 38 which used the piezoelectric element 44. The piezoelectric element 44 vibrates according to the voltage from a pulse. Drawing 6 shows the relation between the voltage added to the piezoelectric element 44, and the amplitude of vibration. Vibration also becomes large as voltage becomes large. The frequency of a pulse is changed based on frequency information, a pulse amplitude is changed based on amplitude information, and, thereby, the vibrational frequency and amplitude of the piezoelectric element 44 can be changed.

[0022]Drawing 7 and drawing 8 show the modification of the tremor 38. The tremor 38 is constituted by the motor 46, the eccentric cam 48 attached to the motor 46, the vibration body 50 which contacts an eccentric cam, the indicator 52 which directs the vibration body 50, and the spring 54 which energizes the vibration body 50 to the eccentric cam 48. In this case, among audio secondary analytical data, according to either frequency information or amplitude information, as voltage is applied to a motor according to the value which multiplied both information, the number of rotations of a motor is changed. Therefore, the vibration body 50 can change vibrational frequency according to audio strength.

[0023]In drawing 7 and drawing 8, if the eccentricity grade of the eccentric cam 48 is adjusted electrically, while the number of rotations of a motor is changeable using frequency information, the stroke of the eccentric cam 48 is changeable by amplitude information. Thereby, the vibrational frequency and amplitude of the vibration body 50 are changeable.

[0024]As mentioned above, if frequency information and amplitude information are sent about "***", "***", "***", and "***", respectively so that clearly, the piezoelectric element 44 will vibrate according to the information. The person holding the vibration output device 12 receives feeling for which the vibration output device 12 has cried, "***", "***", "***", and "***." As for the display 10 shown in drawing 1, the display of "do your best" is performed in parallel to vibration. According to the synergistic effect of a display and vibration, a sending person's volition can be told still more strongly.

[0025]Drawing 2 shows a 2nd embodiment of the data transmission unit by vibration concerning this invention. In a 1st embodiment, although the display 10 and the vibration output device 12 were formed in the output side of the microcomputer M, in a 2nd embodiment, the sending set 13 is formed in instead of [these]. The receiving set 16 which receives the signal sent from the sending set 13, the display 17 connected to the receiving set 16, and the vibration output device 18 connected to the receiving set 16 are formed.

[0026]The sending set 13 sends out the secondary analytical data of the sound mentioned above, and text data. The receiving set 16 receives the secondary analytical data of these sounds, and text data, and outputs audio secondary analytical data to the vibration output device 18, and it outputs text data to the display 17. As mentioned above, the vibration output device 18 vibrates according to audio secondary analytical data, and as for the display 17, the display of a text is made according to text data. By a 2nd embodiment, the information by vibration can be sent to the receiving set in the position which is

separated from a sending set.

[0027]Drawing 3 shows a 3rd embodiment of the data transmission unit by vibration concerning this invention. Compared with a 1st embodiment, the timer 20, the heartbeat measuring instrument 22, the pulse measuring instrument 26, and the sweat sensor 24 are further formed in the input side of the microcomputer M. Since each generates the above-mentioned start signal, the timer 20, the heartbeat measuring instrument 22, the pulse measuring instrument 26, and the sweat sensor 24 are used.

[0028]Progress of a set period will constitute the timer 20 so that a start signal may be emitted.

[0029]The heartbeat measuring instrument 22 measures the heart rate of the person holding the data transmission unit by vibration, and if a heart rate exceeds a predetermined value, it is constituted so that a start signal may be emitted.

[0030]The pulse measuring instrument 26 measures the pulse rate of the person holding the data transmission unit by vibration, and if a pulse rate exceeds a predetermined value, it is constituted so that a start signal may be emitted.

[0031]The sweat sensor 24 measures the electric resistance value for the perspiration grade of the person holding the data transmission unit by vibration, and two points of the skin, and if a perspiration grade exceeds a predetermined value, it is constituted so that a start signal may be emitted.

[0032]In a 3rd embodiment, the display 10 and the vibration output device 12 can also send the information by vibration to the receiving set in the position which is separated from a sending set, if a sending set and a receiving set are used as shown in a 2nd embodiment.

[0033]Next, an example of a utilizing method is explained. Beforehand, a user is a text by sound or a keyboard, and inputs a message ("do your best", "don't get impatient", "fall and attach", etc.) with a sound / text input device 2. And the secondary analytical data of the inputted sound are memorized to the storage unit 8. By one [a test switch (not shown)], a start signal is emitted, and a message is changed into the vibration pattern corresponding to a message, and vibrates with the vibration output device 12. A user masters the meaning of a vibration pattern by learning a message and its vibration pattern.

[0034]When a user carries the data transmission unit by vibration, the vibration output device 12 vibrates with a certain vibration pattern with the start signal emitted from the timer 20, the heartbeat measuring instrument 22, the pulse measuring instrument 26, or a sweat sensor 24. With this vibration pattern, a user understands the learned meaning and transfer of a message is made. If the start signal which changed with the timer 20, the heartbeat measuring instrument 22, the pulse measuring instrument 26, and sweat sensors 24 is emitted, it is possible to match a different message.

[0035]Also in the case of the situation where information cannot be transmitted only using a message indicator, by changing the message of a sound or a text into a vibration pattern, it becomes possible to transmit a message. Signal transduction with presence and presence becomes possible by sensing vibration with the body.

[0036]Voice secondary analytical data can be added to the display 10 in addition to vibration output device 12, and can also be made to change the luminosity of a display.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The block diagram of the data transmission unit by vibration by a 1st embodiment.

[Drawing 2]The block diagram of the data transmission unit by vibration by a 2nd embodiment.

[Drawing 3]The block diagram of the data transmission unit by vibration by a 3rd embodiment.

[Drawing 4]The block diagram of a vibration output device.

[Drawing 5]The sectional view of the tremulor using a piezoelectric element.

[Drawing 6]The operating characteristic figure of a piezoelectric element.

[Drawing 7]The schematic diagram of the tremulor using a motor.

[Drawing 8]The schematic diagram in another state of the tremulor using a motor.

[Drawing 9]The wave form chart of voice primary analytical data.

[Drawing 10]The wave form chart of voice secondary analytical data.

[Drawing 11]The flow chart for obtaining voice primary analytical data.

[Description of Notations]

2 -- A sound / text input device

4 -- CPU (central arithmetic unit)

6 -- Memory

8 -- Storage unit

10 -- Display

12 -- Vibration output device

13 -- Sending set

16 -- Receiving set

20 -- Timer

22 -- Heartbeat measuring instrument

23 -- Pulse measuring instrument

24 -- Sweat sensor

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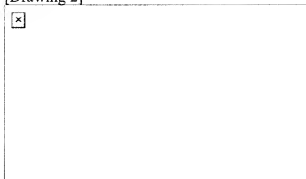
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DRAWINGS

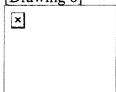
[Drawing 1]



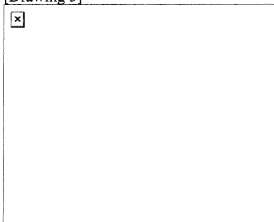
[Drawing 2]



[Drawing 6]



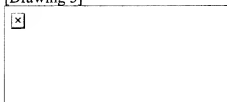
[Drawing 3]



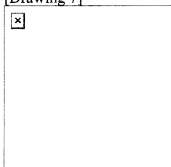
[Drawing 4]



[Drawing 5]



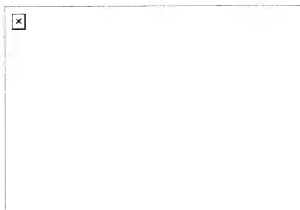
[Drawing 7]



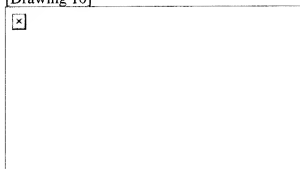
[Drawing 8]



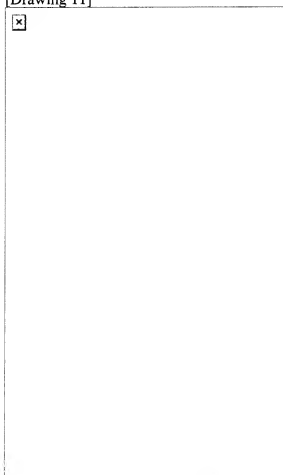
[Drawing 9]



[Drawing 10]



[Drawing 11]



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